

PURCHASE DESCRIPTION

SIGNAL GENERATOR (8 GHz to 20 GHz)

FSNTU-B

1.0 GENERAL This procurement requires a stable microwave signal generator capable of generating signals over the frequency range of 8 GHz to 20 GHz with external AM, internal and external FM, and Pulse modulation with delay capabilities.

2.0 CLASSIFICATION The equipment shall meet the requirements of MIL-T-28800(), Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications with the following modifications and exceptions:

- a. The Electromagnetic Interference requirements of MIL-T-28800() are limited to CE03, CS01, CS02 (0.05 to 100 MHz), CS06, RE02 (14 kHz to 10 GHz), and RS03.
- b. The warm-up time is extended to one hour.

3.0 OPERATIONAL REQUIREMENTS The equipment shall be capable of generating signals within the parameters and accuracies specified herein.

3.1 Frequency Characteristics

3.1.1 Range: At least 8.0 GHz to 20.0 GHz

3.1.2 Resolution: At least 1 kHz; digital readout

3.1.3 Accuracy: Equal to reference standard (CW mode)

3.1.4 Stability (Equal to or better than limits specified below)

3.1.4.1 Internal: Less than 1 part in 10^9 /h at $25^\circ\text{C} \pm 5^\circ\text{C}$ after one hour warmup

3.1.4.2 External: Equal to external standard

3.1.4.3 Temperature: Less than ± 2 parts in 10^5 change over 0 to 50°C

3.1.5 Residual Modulation (CW mode in 50 Hz to 15 kHz detection BW)

3.1.5.1 FM: Less than 300 Hz rms

3.1.5.2 AM: Less than 0.3% pk

3.1.6 Spectral Purity

3.1.6.1 Harmonics: < -55 dBc

3.1.6.2 Power line/Fan rotation related harmonics: < -40 dBc (< 1 kHz from carrier)

3.1.6.3 Non-harmonics/Spurious: < -55 dBc (≥ 10 kHz from carrier)

3.1.6.4 Phase Noise: < -70 dBc/Hz (10 kHz offset from carrier)

3.2 Output Characteristics {F = Output Frequency}

- 3.2.1 Range: +10 to -90 dBm (minimum) [F < 18 GHz]
+7 to -90 dBm (minimum) [F > 18 GHz]
- 3.2.2 RF Output: Leveled output +10 dBm or less [F < 18 GHz]; +7 dBm [F > 18 GHz]
- 3.2.3 Accuracy: ± 2.0 dB
- 3.2.4 Display/Resolution: Digital display; minimum resolution of 0.1 dB
- 3.2.5 Flatness: ± 1.5 dB measured at an output level of 0 dBm
- 3.2.6 Impedance/Connector: 50 ohms; type-N female connector or SMA
- 3.2.6.1 VSWR: < 2.5:1 [at levels < 0 dBm]
- 3.2.7 Reverse Power Protection: The generator shall be capable of accepting the following signal levels at its output connector or external isolator without resulting damage.
- 3.2.7.1 Average Power: 4 watts [F<12 GHz]; 1 watt [F>12 GHz]
- 3.2.7.2 Peak Power: 2.5 kilowatts [F<12 GHz][Widths < 10 μ s]

3.3 Modulation Characteristics

3.3.1 Pulse Modulation

3.3.1.1 Internal

- 3.3.1.1.1 Rate (PRF): At least 100 Hz to 1 MHz
- 3.3.1.1.2 Width (PW): 0.1 to 10.0 μ s
- 3.3.1.1.3 Rise/Fall Times: Less than 25 ns
- 3.3.1.1.4 ON/OFF Ratio: Greater than 80 dB
- 3.3.1.1.5 Delay: At least 100 ns to 100 ms; accuracy 20% of setting
- 3.3.1.1.5.1 Sync Pulse Output: TTL compatible; rise time less than 50 ns
- 3.3.1.1.5.2 Video Pulse Output: TTL compatible; width corresponds to PW control setting.
- 3.3.1.1.6 External Trigger Input: TTL compatible; at least 100 Hz to 50 kHz, provides sync rate for pulse modulation

3.3.1.2 External

- 3.3.1.2.1 Rate (PRF): At least 100 Hz to 1 MHz
- 3.3.1.2.2 Width (PW): Greater than 0.1 μ s
- 3.3.1.2.3 Video Output: TTL compatible pulse; same PW and PRF as external input pulse
- 3.3.1.2.4 Pulse Input: TTL compatible

3.3.2 Amplitude Modulation (AM) {Can be used simultaneously with pulse modulation}

3.3.2.1 External

- 3.3.2.1.1 Rate: At least 0.1 - 10 kHz
- 3.3.2.1.2 Depth: 0 to 70% minimum
- 3.3.2.1.3 Sensitivity: At least 70%/V

- 3.3.3 Frequency Modulation (FM) {F = carrier freq / ΔF = peak freq deviation}
- 3.3.3.1 Internal FM
 - 3.3.3.1.1 Rate: At least 1 kHz to 100 kHz
 - 3.3.3.1.2 FM Deviation: At least 10 kHz to 1 MHz peak
 - 3.3.3.1.3 FM Accuracy: $\pm 20\%$
 - 3.3.3.1.4 Incidental AM: $\leq 7\%$ (50 Hz - 15 kHz BW)[$\Delta F = 100$ kHz @ 10 kHz]
- 3.3.3.2 External FM
 - 3.3.3.2.1 Rates: At least 1 kHz to 1 MHz
 - 3.3.3.2.2 FM Deviation: At least 10 kHz to 1 MHz peak
 - 3.3.3.2.3 FM Accuracy: $\pm 20\%$
 - 3.3.3.2.4 Distortion: $\leq 10\%$ [$\Delta F = 100$ kHz @ 10 kHz]

4.0 GENERAL REQUIREMENTS

- 4.1 Power: 115 Vac $\pm 10\%$ single phase, 50, 60 or 400 Hz, and 230 Vac $\pm 10\%$ single phase, 50 and 60 Hz; 400 VA maximum
- 4.2 Dimensions: The total volume shall not exceed 39,400 cm³ (2,400 in³).
- 4.3 Weight: The overall weight shall not exceed 22.7 kg (50 lb).
- 4.4 Calibration Interval: The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.
- 4.5 Remote Operation: The unit will be capable of remote operation via IEEE-488() bus interface. At a minimum it shall operate as a listener such that all major functions except the power on/off switch are controllable and shall have as a minimum the following subset of GPIB commands: AH1, SH1, L4.